

Interactive comment on “Development of a multi-method chronology spanning the Last Glacial Interval from Orakei maar lake, Auckland, New Zealand” by Leonie Peti et al.

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We thank Referee #1 for their constructive and helpful review and address the raised below. RC1 = reviewer comment from referee #1. C1-C9 = comments 1 to 9 followed by our response.

Specific comments

(RC1-C1) The abstract is very long (spanning two paragraphs). I would suggest to remove the discussion of the Be-10 from the abstract - better to focus on the chronological methods that were incorporated into the final age model. Response to (RC1-C1):

C1

We have removed the Be-10 part from the abstract and reduced it to one paragraph as suggested.

(RC1-C2) With SHCal20 now out I leave it up to the authors whether they choose to update their chronology. I would certainly encourage this, since presumably the next step will be palaeoclimate interpretations. Response to (RC1-C2): The age model has been updated with SHCal20.

(RC1-C3) Discussion of reservoir corrections for radiocarbon dating is brief, and slightly conflates the 'hardwater effect' with the marine reservoir effect, which arise due to separate processes. I wouldn't have thought that there would be much of a hardwater effect as the catchment is presumably basaltic rather than carbonate? Response to (RC1-C3): Surprisingly we have observed higher CaCO₃ contents than expected in places within the sequence. We have removed the sentence on marine reservoir corrections to eliminate the confusion.

(RC1-C4) For the tuning of the palaeomagnetic RPI curve, why were the tuning points selected randomly? It would seem better to select parts where there is more confidence in the alignment? Or, perhaps at least explain why a random approach is used for the DTW algorithm. Response to (RC1-C4): To explain this, we have added: "We chose to select these tuning points randomly (apart from the basal point) in order to prevent any bias that involved selecting points to arrive at a favoured solution"

(RC1-C5) Is the geomagnetic excursion at 62 ka the Greenland-Norwegian Sea excursion? Was this considered to be used in the chronology development? It seems quite well defined in the Orakei RPI (though perhaps the trough is not clear). Response to (RC1-C5): Maybe, given that Quentin Simon has raised the same observation we added a whole paragraph on this possibility: "The short-duration RPI trough around 52 m aligns with a very shallow inclination of +0.4° at 51.2 m (Fig. 6). The combination of inclination, low RPI and its depth (inferring an age of ca. 61,000 yr) suggests that this may be the Norwegian-Greenland Sea Excursion (Bleil and Gard, 1989; Løvlie, 1989).

C2

This probable reversal of the geomagnetic field was considered to be restricted to high latitudes accompanied by a global low in geomagnetic field intensity and has been confirmed in various northern high-latitude sites (Channell et al., 1997; Nowaczyk et al., 1994, 2003; Nowaczyk and Baumann, 1992; Nowaczyk and Frederichs, 1999; Simon et al., 2012; Xuan et al., 2012). However, low field strength and potentially excursions directions have also been interpreted as the Norwegian-Greenland Sea Excursion in Black Sea sediments (Liu et al., 2020; Nowaczyk et al., 2013) and the Western Equatorial Pacific (Lund et al., 2017). The occurrence of the Norwegian-Greenland Sea Excursion in the Orakei maar lake record would thus constitute its first observation this far south although additional samples are needed to confirm its occurrence in the Orakei record.”

Technical corrections

(RC1-C6) Line 50-52: 'Orakei maar paleolake is of unprecedented quality...' Please quantify this statement. Response to (RC1-C6): We are not sure how this is supposed to be quantified but we updated the sentence to “The sediment record from the Orakei maar paleolake is unprecedented in its combination of length, resolution, and completeness in the context of the terrestrial south-west (SW) Pacific.”

(RC1-C7) Line 85: 'improve temporal constraints on regional of palaeoclimatic...' Please rephrase. Response to (RC1-C7): Deleted “of”, see comment (RC3-C11)

(RC1-C8) Fig 6 and 7: I believe these will need to be reformatted into a portrait format. Response to (RC1-C8): Figures are reformatted (and updated) into portrait format.

(RC1-C9) Line 151: There is no section 3.6.1? Response to (RC1-C9): Corrected to “section 3.7”.

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